JOURNAL OF FISH BIOLOGY

Editor

JOHN THORPE

LIBRARY
JAN 13 1997
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii

VOLUME 49

July to December 1996

Published for the Fisheries Society of the British Isles by Academic Press
London San Diego New York
Boston Sydney Tokyo Toronto

Copyright © 1996 The Fisheries Society of the British Isles

Printed in Great Britain by Henry Ling Ltd., at the Dorset Press, Dorchester, Dorset

Number 1 July 1996

IMBROCK, F., APPENZELLER, A. and ECKMANN, R., Diel and seasonal distribution of perch in Lake Constance: a hydroacoustic study and *in situ* observations 1

HYNDES, G. A. and POTTER, I. C., Comparisons between the age structures, growth and reproductive biology of two co-occurring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia 14

JENSEN, J. W. and HESTHAGEN, T., Direct estimates of the selectivity of a multimesh and a series of single gillnets for brown trout 33

SAYER, M. D. J. and READER, J. P., Exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity: survival, blood physiology and seasonal variation 41

SAYER, M. D. J. and DAVENPORT, J., Hypometabolism in torpid goldsinny wrasse subjected to rapid reductions in seawater temperature 64

SAYER, M. D. J., GIBSON, R. N. and ATKINSON, R. J. A., Growth, diet and condition of corkwing wrasse and rock cook on the west coast of Scotland 76

NORTHCOTT, S. J. and JAMES, M. A., Ultrastructure of the glandular epidermis of the fins of male estuarine triplefins *Forsterygion nigripenne* 95

SVÅSAND, T., JØRSTAD, K. E., OTTERÅ, H. and KJESBU, O. S., Differences in growth performance between Arcto-Norwegian and Norwegian coastal cod reared under identical conditions 108

GIBSON, R. N. and ROBB, L., Piscine predation on juvenile fishes on a Scottish sandy beach 120

IKEBE, Y. and OISHI, T., Correlation between environmental parameters and behaviour during high tides in *Periophthalmus modestus* 139

BARNETT, R. R., AKINDELE, T., ORTE, C. and SHEPHARD, K. L., Eosinophilic granulocytes in the epidermis of *Oreochromis mossambicus* gill filaments studied *in situ* 148

BOHLIN, T., DELLEFORS, C. and FAREMO, U., Date of smolt migration depends on body-size but not age in wild sea-run brown trout 157

BRIEF COMMUNICATIONS

KNOPH, M. B. and MÅSØVAL, K., Plasma ammonia and urea levels in Atlantic salmon farmed in sea water 165

LEE, W.-J. and KOCHER, T. D., Microsatellite DNA markers for genetic mapping in *Oreochromis niloticus* 169

Number 2 August 1996

SABOROWSKI, R. and BUCHHOLZ, F., Annual changes in the nutritive state of North Sea dab 173

ALIKIN, Y. S., SHCHELKUNOV, I. S., SHCHELKUNOVA, T. I., KUPINSKAYA, O. A., MASYCHEVA, V. I., KLIMENKO, V. P. and FADINA, V. A., Prophylactic treatment of viral diseases in fish using native RNA linked to soluble and corpuscular carriers 195

RUSSELL, N. R., FISH, J. D. and WOOTTON, R. J., Feeding and growth of juvenile sea bass: the effect of ration and temperature on growth rate and efficiency 206

KRAUSE, J., GODIN, J.-G. J. and BROWN, D., Size-assortativeness in multi-species fish shoals 221

THORARENSEN, H., GALLAUGHER, P. E. and FARRELL, A. P., The limitations of heart rate as a predictor of metabolic rate in fish .. 226

GREGORY, J. S. and GRIFFITH, J. S., Aggressive behaviour of under-yearling rainbow trout in simulated winter concealment habitat .. 237

OTA, D., MARCHESAN, M. and FERRERO, E. A., Sperm release behaviour and fertilization in the grass goby 246

ARNDT, S. K. A., BENFEY, T. J. and CUNJAK, R. A., Effect of temporary reductions in feeding on protein synthesis and energy storage of juvenile Atlantic salmon 257

BASIAO, Z. U., DOYLE, R. W. and ARAGO, A. L., A statistical power analysis of the ' internal reference ' technique for comparing growth and growth depensation of tilapia strains 277

LOWE, T. E. and WELLS, R. M. G., Primary and secondary stress responses to line capture in the blue mao mao 287

HAUGEN, T. O. and RYGG, T. A., Food- and habitat-segregation in sympatric grayling and brown trout 301

GORDON, M. S., PLAUT, I. and KIM, D., How puffers (Teleostei: Tetraodontidae) swim 319

HORPPILA, J., NYBERG, K., PELTONEN, H. and TURUNEN, T., Effects of five years of intensive trawling on a previously unexploited smelt stock .. 329

BAKKE, T. A., JANSEN, P. A. and HARRIS, P. D., Differences in susceptibility of anadromous and resident stocks of Arctic charr to infections of *Gyrodactylus salaris* under experimental conditions 341

BRIEF COMMUNICATIONS

SASAL, P., FALIEX, E. and MORAND, S., Population structure of *Gobius bucchichii* in a Mediterranean marine reserve and in an unprotected area 352

MORON, S. E. and FERNANDES, M. N., Pavement cell ultrastructural differences on *Hoplias malabaricus* gill epithelia 357

ALMADA, V. C., AMORIM, M. C. P., ALMADA, E., PEREÍRA, F. MATOS, R. and GODINHO, R., Agonistic behaviour and sound production in *Gaidropsarus mediterraneus* (Gadidae) 363

GONÇALVES, E. J., ALMADA, V. C., ALMEIDA, S. P., GONÇALVES, D. M., REPAS, M. and SIMÕES, N., Observations on the agonistic behaviour of *Lepadogaster lepadogaster purpurea* (Pisces: Gobiesocidae) .. 367

PETTERSSON, J., JOHNSSON, J. I. and BOHLIN, T., The competitive advantage of large body size declines with increasing group size in rainbow trout 370

BOOK REVIEW 373

Number 3 September 1996

JOHNSTON, T. A. and MATHIAS, A., Gut evacuation and absorption efficiency of walleye larvae 375

BELS, V. L. and DAVENPORT, J., A comparison of food capture and ingestion in juveniles of two flatfish species, *Pleuronectes platessa* and *Limanda limanda* (Teleostei: Pleuronectiformes) 390

APPLEBY, C., Population dynamics of *Gyrodactylus* sp. (Monogenea) infecting the sand goby in the Oslo Fjord, Norway 402

BEACHAM, T. D., MILLER, K. M. and WITHLER, R. E., Minisatellite DNA variation and stock identification of coho salmon 411

KECKEIS, H., BAUER-NEMESCHKAL, E. and KAMLER, E., Effects of reduced oxygen level on the mortality and hatching rate of *Chondrostoma nasus* embryos 430

HUUSKO, A., VUORIMIES, O. and SUTELA, T., Temperature- and light-mediated predation by perch on vendace larvae 441

STOUMBOUDI, M. TH. and ABRAHAM, M., The spermatogenetic process in *Barbus longiceps*, *Capoeta damascina* and their natural sterile hybrid (Teleostei, Cyprinidae) 458

BEDDOW, T. A. and ROSS, L. G., Predicting biomass of Atlantic salmon from morphometric lateral measurements 469

TIERNEY, J. F., HUNTINGFORD, F. A. and CROMPTON, D. W. T., Body condition and reproductive status in sticklebacks exposed to a single wave of *Schistocephalus solidus* infection 483

MIKHEEV, V. N., ADAMS, C. E., HUNTINGFORD, F. A. and THORPE, J. E., Behavioural responses of benthic and pelagic Arctic charr to substratum heterogeneity 494

RUOHONEN, K. and GROVE, D. J., Gastrointestinal responses of rainbow trout to dry pellet and low-fat herring diets 501

PAXTON, C. G. M., Isolation and the development of shoaling in two populations of the guppy 514

ROMBOUT, J. H. W. M., KOUMANS-VAN DIEPEN, J. C. E., EMMER, P. M., TAVERNE-THIELE, J. J. and TAVERNE, N., Characterization of carp thrombocytes with specific monoclonal antibodies 521

BRIEF COMMUNICATIONS

DOUGLAS, R. H., Goldfish use the visual angle of a familiar landmark to locate a food source 532

GROSS, R., NILSSON, J. and SCHMITZ, M., A new species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout 537

CROCKFORD, T., JOHNSTON, I. A., MCANDREW, B. J. and MUTUNGI, G., Contractile properties and the inheritance of myosin heavy chains in *Oreochromis* species with different temperature tolerances 541

SABÓIA-MORAES, S. M. T., HERNANDEZ-BLAZQUEZ, F. J., MOTA, D. L. and BITTENCOURT, A. M., Mucous cell types in the branchial epithelium of the euryhaline fish *Poecilia vivipara* 545

BOOK REVIEWS 549

ANNOUNCEMENT 559

Number 4 October 1996

STERGIOU, K. I., ECONOMIDIS, P. and SINIS, A., Sex ratio, spawning season and size at maturity of red bandfish in the western Aegean Sea .. 561

MERCHIE, G., LAVENS, P., DHERT, PH., GARCÍA ULLOA GÓMEZ, M., NELIS, H., DE LEENHEER, A. and SORGELOOS, P., Dietary ascorbic acid requirements during the hatchery production of turbot larvae 573

SCOCCO, P., CECCARELLI, P. and MENGHI, G., Glycohistochemistry of the *Tilapia* spp. stomach 584

TOMASINI, J. A., COLLART, D. and QUIGNARD, J. P., Female reproductive biology of the sand smelt in brackish lagoons of southern France .. 594

LENFANT, P. and PLANES, S., Genetic differentiation of white sea bream within the Lion's Gulf and the Ligurian Sea (Mediterranean Sea) .. 613

PONCIN, P., PHILIPPART, J. C. and RUWET, J. C., Territorial and non-territorial spawning behaviour in the bream 622

LORENZEN, K., The relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture 627

LUGLI, M., TORRICELLI, P., PAVAN, G. and MILLER, P. J., Breeding sounds of male *Padogobius nigricans* with suggestions for further evolutionary study of vocal behaviour in gobioid fishes 648

JOBLING, M. and KOSKELA, J., Interindividual variations in feeding and growth in rainbow trout during restricted feeding and in a subsequent period of compensatory growth 658

TOFTEN, H. and JOBLING, M., Development of spinal deformities in Atlantic salmon and Arctic charr fed diets supplemented with oxytetracycline 668

BUREL, C., PERSON-LE RUYET, J., GAUMET, F., LE ROUX, A., SÉVÈRE, A. and BOEUF, G., Effects of temperature on growth and metabolism in juvenile turbot 678

BUTTLE, L. G., UGLOW, R. F. and COWX, I. G., The effect of emersion and handling on the nitrogen excretion rates of *Clarias gariepinus* 693

SINGH-RENTON, S. and BROMLEY, P. J., Effects of temperature, prey type and prey size on gastric evacuation in small cod and whiting 702

GUINAND, B., BOUVET, Y. and BROHON, B., Spatial aspects of genetic differentiation of the European chub in the Rhone River basin .. 714

BRIEF COMMUNICATIONS

FARIA, C., ALMADA, V. C. and GONÇALVES, E. J., Juvenile recruitment, growth and maturation of *Lipophrys pholis* (Pisces: Blenniidae), from the west coast of Portugal 727

MARTIN-SMITH, K. M., Length/weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia 731

FERNÁNDEZ, F., MIQUEL, A. G., CUMPLIDO, L. R., GUINEA, J. and ROS, E., Comparisons of faecal collection methods for digestibility determinations in gilthead sea bream 735

THOMASON, J. C., CONN, W., LE COMTE, E. and DAVENPORT, J., Effect of temperature and photoperiod on the growth of the embryonic dogfish, *Scyliorhinus canicula* 739

BOWKER, D. W., The bias associated with the dispersion of length at age in the estimation of growth and mortality parameters from uni-modal length–frequency data 743

BAKER, R. T. M. and DAVIES, S. J., Increased production of docosahexaenoic acid (22 : 6 n-3, DHA) in catfish nutritionally stressed by the feeding of oxidised oils and the modulatory effect of dietary α-tocopheryl acetate 748

EGGINTON, S., Effect of temperature on the optimal substrate for β-oxidation 753

BOOK REVIEWS 759

Number 5 November 1996

FERRERI, C. P. and TAYLOR, W. W., Compensation in individual growth rates and its influence on lake trout population dynamics in the Michigan waters of Lake Superior 763

CARDOSO, E. L., CHIARINI-GARCIA, H., FERREIRA, R. M. A. and POLI, C. R., Morphological changes in the gills of *Lophiosilurus alexandri* exposed to un-ionized ammonia 778

Lo Nostro, F. L. and Guerrero, G. A., Presence of primary and secondary males in a population of the protogynous *Synbranchus marmoratus* 788

Wales, W. and Tytler, P., Changes in chloride cell distribution during early larval stages of *Clupea harengus* 801

Shed'ko, S. V., Ginatulina, L. K., Parpura, I. Z. and Ermolenko, A. V., Evolutionary and taxonomic relationships among Far-Eastern salmonid fishes inferred from mitochondrial DNA divergence 815

Reubush, K. J. and Heath, A. G., Metabolic responses to acute handling by fingerling inland and anadromous striped bass 830

Vieira, V. L. A. and Johnston, I. A., Muscle development in the tambaqui, an important Amazonian food fish 842

Wardle, C. S., Soofiani, N. M., O'Neill, F. G., Glass, C. W. and Johnstone, A. D. F., Measurements of aerobic metabolism of a school of horse mackerel at different swimming speeds 854

Cui, Y., Hung, S. S. O. and Zhu, X., Effect of ration and body size on the energy budget of juvenile white sturgeon 863

Mangel, M., Computing expected reproductive success of female Atlantic salmon as a function of smolt size 877

Rinchard, J. and Kestemont, P., Comparative study of reproductive biology in single- and multiple-spawner cyprinid fish. I. Morphological and histological features 883

Yamamoto, T. S. and Kobayashi, W., Formation of the enveloping layer of the chum salmon egg in isotonic salt solutions 895

Holmgren, K. and Mosegaard, H., Implications of individual growth status on the future sex of the European eel 910

Imsland, A. K., Sunde, L. M., Folkvord, A. and Stefansson, S. O., The interaction of temperature and fish size on growth of juvenile turbot.. 926

Bell, M. V., McEvoy, L. A. and Navarro, J. C., Deficit of didocosahexaenoyl phospholipid in the eyes of larval sea bass fed an essential fatty acid deficient diet 941

Cavalli, L. and Chappaz, R., Diet, growth and reproduction of the Arctic charr in a high alpine lake 953

Thomason, J. C., Davenport, J. and Le Comte, E., Ventilatory mechanisms and the effect of hypoxia and temperature on the embryonic lesser spotted dogfish.. 965

Smedstad, O. M. and Holm, J. C., Validation of back-calculation formulae for cod otoliths 973

Peters, L. D. and Livingstone, D. R., Antioxidant enzyme activities in embryologic and early larval stages of turbot 986

Koljonen, M.-L. and McKinnell, S., Assessing seasonal changes in stock composition of Atlantic salmon catches in the Baltic Sea with genetic stock identification 998

EVERSON, I., KOCK, K.-H. and PARKES, G., Ovarian development associated with first maturity in three Antarctic channichthyid species .. 1019

BRIEF COMMUNICATIONS

SIMONOVIĆ, P. D., NIKOLIĆ, V. P. and SKORA, K. E., Vertebral number in Ponto-Caspian gobies: phylogenetic relevance 1027

MCKINNON, J. S., Red coloration and male parental behaviour in the threespine stickleback 1030

TAHARA, D. and MUGIYA, Y., Diel variation in branchial calcium uptake by the rainbow trout 1034

ARMSTRONG, J. D. and STEWART, D. C., The relationship between first vertebra width and body length of Atlantic salmon differs between parr and smolts 1038

ANNOUNCEMENTS 1041

Number 6 December 1996

WINEMILLER, K. O. and KELSO-WINEMILLER, L. C., Comparative ecology of catfishes of the Upper Zambezi River floodplain 1043

HARTNEY, K. B., Site fidelity and homing behaviour of some kelp-bed fishes 1062

MODIN, J. and PIHL, L., Small-scale distribution of juvenile plaice and flounder in relation to predatory shrimp in a shallow Swedish bay .. 1070

LACROIX, G. L. and MCCURDY, P., Migratory behaviour of post-smolt Atlantic salmon during initial stages of seaward migration 1086

CASTILLO-RIVERA, M., KOBELKOWSKY, A. and ZAMAYOA, V., Food resource partitioning and trophic morphology of *Brevoortia gunteri* and *B. patronus* 1102

PERDICES, A., MACHORDOM, A. and DOADRIO, I., Allozymic variation and relationships of the endangered cyprinodontid genus *Valencia* and its implications for conservation 1112

VITTURI, R., LIBERTINI, A., MAZZOLA, A., COLOMBA, M. S. and SARA, G., Characterization of mitotic chromosomes of four species of the genus *Diplodus*: karyotypes and chromosomal nucleolar organizer region phenotypes 1128

HANSON, J. M., Seasonal distribution of juvenile Atlantic cod in the southern Gulf of St Lawrence 1138

DE SILVA, S. S., AMARASINGHE, U. S. and WIJEGOONAWARDENA, N. D. N. S., Diel feeding patterns and daily ration of cyprinid species in the wild determined using an iterative method, MAXIMS 1153

SERVENTI, M., HARRISON, I. J., TORRICELLI, P. and GANDOLFI, G., The use of pigmentation and morphological characters to identify Italian mullet fry 1163

BOURKE, P., MAGNAN, P. and RODRÍGUEZ, M. A., Diel locomotor activity of brook charr, as determined by radiotelemetry 1174

WETHERBEE, B. M., Distribution and reproduction of the southern lantern shark from New Zealand 1186

KJESBU, O. S., KRYVI, H. and NORBERG, B., Oocyte size and structure in relation to blood plasma steroid hormones in individually monitored, spawning Atlantic cod 1197

BROWN, B., BENVENISTE, L. M. and MOLLER, P., Basal expansion of anal-fin rays: a new osteological character in weakly discharging electric fish (Mormyridae) 1216

NORDLIE, F. G. and MIRANDI, A., Salinity relationships in a freshwater population of eastern mosquitofish 1226

GU, B., SCHELSKE, C. L. and HOYER, M. V., Stable isotopes of carbon and nitrogen as indicators of diet and trophic structure of the fish community in a shallow hypereutrophic lake 1233

NAGELKERKE, L. A. J. and SIBBING, F. A., Reproductive segregation among the *Barbus intermedius* complex of Lake Tana, Ethiopia. An example of intralacustrine speciation? 1244

CALTRAN, H. and SILAN, P., Gill filaments of *Liza ramada*, a biotope for ectoparasites: surface area acquisition using image analysis and growth models 1267

KILARSKI, W. M., ROMEK, M., KOZLOWSKA, M. and GÖRLICH, A., Short-term thermal acclimation induces adaptive changes in the inner mitochondrial membranes of fish skeletal muscle 1280

ALKINDI, A. Y. A., BROWN, J. A., WARING, C. P. and COLLINS, J. E., Endocrine, osmoregulatory, respiratory and haematological parameters in flounder exposed to the water soluble fraction of crude oil 1291

GILLIS, T. E. and BALLANTYNE, J. S., The effects of starvation on plasma free amino acid and glucose concentrations in lake sturgeon 1306

ARCULEO, M., MAURO, A., SCELSA, G., LO BRUTTO, S., CAMMARATA, M. and PARRINELLO, N., Protein differences among the Mediterranean species of the genus *Spicara* 1317

BRIEF COMMUNICATIONS

RADCHENKO, V. I. and SEMENCHENKO, A. YU., Predation of doggertooth on immature Pacific salmon 1323

PRESA, P. and GUYOMARD, R., Conservation of microsatellites in three species of salmonids 1326

BARTON, B. A. and GROSH, R. S., Effect of AC electroshock on blood features in juvenile rainbow trout 1330

α-tocopheryl acetate, increased production of docosahexaenoic acid (22: 6 n-3, DHA) in catfish nutritionally stressed by the feeding of oxidised oils and the modulatory effect of, 748
Abraham, M. (see Stoumboudi, M. Th.), 458
Absorption efficiency and gut evacuation of walleye larvae, 375
Acclimation, short term thermal, induces adaptive changes in the inner mitochondrial membranes of fish skeletal muscle, 1280
Adams, C. E. (see Mikheev, V. N.), 494
Aegean Sea, sex ratio, spawning season and size at maturity of red bandfish in the, 561
Aerobic metabolism of a school of horse mackerel at different swimming speeds, measurements of, 854
Age, bias associated with the dispersion of length at age in the estimation of growth and mortality parameters from uni-modal length–frequency data, 743
Age, smolt migration in wild sea-run brown trout, 157
Age structures, growth and reproductive biology of two co-occurring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia, 14
Aggressive behaviour of underyearling rainbow trout in simulated winter concealment habitat, 237
Agonistic behaviour of *Lepadogaster lepadogaster purpurea* (Pisces: Gobiesocidae), 367
Agonistic behaviour and sound production in *Gaidropsarus mediterraneus* (Gadidae), 363
Akindele, T. (see Barnett, R. R.), 148
Alikin, Y. S., Shchelkunov, I. S., Shchelkunova, T. I., Kupinskaya, O. A., Masycheva, V. I., Klimenko, V. P. and Fadina, V. A., Prophylactic treatment of viral diseases in fish using native RNA linked to soluble and corpuscular carriers, 195
Alkindi, A. Y. A., Brown, J. A., Waring, C. P. and Collins, J. E., Endocrine, osmoregulatory, respiratory and haematological parameters in flounder exposed to the water soluble fraction of crude oil, 1291
Allozymic variation and relationships of the endangered cyprinodontid genus *Valencia* and its implications for conservation, 1112
Almada, E. (see Almada, V. C.), 363
Almada, V. C., Amorim, M. C. P., Almada, E. Pereíra, F. Matos, R. and Godinho, R., Agonistic behaviour and sound prouduction in *Gaidropsarus mediterraneus* (Gadidae), 363
Almada, V. C. (see Faria, C.), 727
Almada, V. C. (see Gonçalves, E. J.), 367
Almeida, S. P. (see Gonçalves, E. J.), 367
Amarasinghe, U. S. (see De Silva, S. S.), 1153
Ammonia, plasma, and urea levels in Atlantic salmon farmed in sea water, 165
Amorim, M. C. P. (see Almada, V. C.), 363
Annual changes in the nutritive state of North Sea dab, 173
Antibodies, monoclonal, characterization of carp thrombocytes with specific, 521
Antioxidant enzyme activities in embryologic and early larval stages of turbot, 986
Appenzeller, A. (see Imbrock, F.), 1
Appleby, C., Population dynamics of *Gyrodactylus* sp. (Monogenea) infecting the sand goby in the Oslo Fjord, Norway, 402
Arago, A. L. (see Basiao, Z. U.), 277
Arctic charr, benthic and pelagic, behavioural responses to substratum heterogeneity, 494
Arctic charr, development of spinal deformities when fed diets supplemented with oxytetracycline, 668
Arctic charr, diet, growth and reproduction in a high alpine lake, 953
Arctic charr, differences in susceptibility of anadromous and resident stocks to infections of *Gyrodactylus salaris* under experimental conditions, 341
Arcto-Norwegian and Norwegian coastal cod reared under identitical conditions, differences in growth performance, 108
Arculeo, M., Mauro, A. Scelsa, G., Lo Brutto, S., Cammarata, M. and Parrinello, N., Protein differences among the Mediterranean species of the genus *Spicara*, 1317

Armstrong, J. D. and Stewart, D. C., The relationship between first vertebra width and body length of Atlantic salmon differs between parr and smolts, 1038
Arndt, S. K. A., Benfey, T. J. and Cunjak, R. A., Effect of temporary reductions in feeding on protein synthesis and energy storage of juvenile Atlantic salmon, 257
Ascorbic acid requirements during the hatchery production of turbot larvae, 573
Assessing seasonal changes in stock composition of Atlantic salmon catches in the Baltic Sea with genetic stock identification, 998
Atkinson, R. J. A. (see Sayer, M. D. J.), 76
Atlantic cod, Seasonal distribution in the southern Gulf of St Lawrence, 1138
Atlantic cod, spawning, oocyte size and structure in relation to blood plasma steroid hormones, individually monitored, 1197
Atlantic salmon, assessing seasonal changes in stock composition of catches in the Baltic Sea with genetic stock identification, 998
Atlantic salmon, development of spinal deformities when fed diets supplemented with oxytetracycline, 668
Atlantic salmon, female, computing expected reproductive success as a function of smolt size, 877
Atlantic salmon, juvenile, effect of temporary reductions in feeding on protein synthesis and energy storage of, 257
Atlantic salmon, migratory behaviour of post-smolt Atlantic salmon during initial stages of seaward migration, 1086
Atlantic salmon, plasma ammonia and urea levels in Atlantic salmon farmed in sea water, 165
Atlantic salmon, predicting biomass of from morphometric lateral measurements, 469
Atlantic salmon, relationship between first vertebra width and body length differs between parr and smolts, 1038
Atlantic salmon, species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
Australia, comparisons between the age structures, growth and reproductive biology of two co-occurring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters, 14

β-oxidation, effect of temperature on the optimal substrate for, 753
Baker, R. T. M. and Davies, S. J., Increased production of docosahexaenoic acid (22: 6 n-3, DHA) in catfish nutritionally stressed by the feeding of oxidized oils and the modulatory effect of dietary α-tocopheryl acetate, 748
Bakke, T. A., Jansen, P. A. and Harris, P. D., Differences in susceptibility of anadromous and resident stocks of Arctic charr to infections of *Gyrodactylus salaris* under experimental conditions, 341
Ballantyne, J. S. (see Gillis, T. E.), 1306
Bandfish, red, in the western Aegean Sea, sex ratio, spawning season and size at maturity of, 561
Barbus intermedius complex of Lake Tana, Ethiopia, reproductive segregation among. An example of intralacustrine speciation?, 1244
Barbus longiceps, Capoeta Damascina and their natural sterile hybrid (Teleostei, Cyprinidae), spermatogenetic process in, 458
Barnett, R. R., Akindele, T, Orte, C. and Shephard, K. L., Eosinophilic granulocytes in the epidermis of *Oreochromis mossambicus* gill filaments studied *in situ*, 148
Barton, B. A. and Grosh, R. S., Effect of AC electroshock on blood features in juvenile rainbow trout, 1330
Basal expansion of anal-fin rays: a new osteological character in weakly discharging electric fish (Mormyridae), 1216
Basiao, Z. U., Doyle, R. W. and Arago, A. L., A statistical power analysis of the 'internal reference' technique for comparing growth and growth depensation of tilapia strains, 277
Bass, striped, metabolic responses to acute handling by fingerling inland and anadromous, 830

Bauer-Nemeschkal, E. (see Keckeis, H.), 430
Beacham, T. D., Miller, K. M. and Withler, R. E., Minisatellite DNA variation and stock identification of coho salmon, 411
Beddow, T. A. and Ross, L. G., Predicting biomass of Atlantic salmon from morphometric lateral measurements, 469
Behavioural responses of benthic and pelagic Arctic charr to substratum heterogeneity, 494
Bell, M. V., McEvoy, L. A. and Navarro, J. C., Deficit of didocosahexaenoyl phospholipid in the eyes of larval sea bass fed an essential fatty acid deficient diet, 941
Bels, V. L. and Davenport, J., A comparison of food capture and ingestion in juveniles of two flatfish species, *Pleuronectes platessa* and *Limanda limanda* (Teleostei: Pleuronectiformes), 390
Benfey, T. J. (see Arndt, S. K. A.), 257
Benthic Arctic charr, behavioural responses to substratum heterogeneity, 494
Benveniste, L. M. (see Brown, B.), 1216
Bias associated with the dispersion of length at age in the estimation of growth and mortality parameters from uni-modal length–frequency data, 743
Biomass of Atlantic salmon, predicting from morphometric lateral measurements, 469
Bittencourt, A. M. (see Sabóia-Moraes, S. M. T.), 545
Blood features, effect of AC electroshock in juvenile rainbow trout, 1330
Blood physiology, exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity: survival, seasonal variation and, 41
Blue mao mao, primary and secondary stress responses to line capture in, 287
Body condition and reproductive status in sticklebacks exposed to a single wave of *Schistocephalus solidus* infection, 483
Body length, relationship with vertebra width of Atlantic salmon differs between parr and smolts, 1038
Body size, competitive advantage of large body size declines with increasing group size in rainbow trout, 370
Body size, effect on the energy budget of juvenile white sturgeon, 863
Body weight, relationship to natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture, 627
Body-size, smolt migration in wild sea-run brown trout, 157
Boeuf, G. (see Burel, C.), 678
Bohlin, T., Dellefors, C. and Faremo, U., Date of smolt migration depends on body-size but not age in wild sea-run brown trout, 157
Bohlin, T. (see Pettersson, J.), 370
Bourke, P., Magnan, P. and Rodriguez, M. A., Diel locomotor activity of brook charr, as determined by radiotelemetry, 1174
Bouvet, Y. (see Guinand, B.), 714
Bowker, D. W., The bias associated with the dispersion of length at age in the estimation of growth and mortality parameters from uni-modal length–frequency data, 743
Branchial epithelium of the euryhaline fish *Peocilia vivipara*, mucous cell types in the, 545
Bream, gilthead sea, comparisons of faecal collection methods for digestibility determinations in, 735
Bream, territorial and non-territorial spawning behaviour in, 622
Bream, white sea, genetic differentiation within the Lion's Gulf and the Ligurian Sea (Mediterranean Sea), 613
Breeding sounds of male *Padogobius nigricans* with suggestions for evolutionary study of vocal behaviour in gobioid fishes, 648
Brevoortia gunteri and *B. patronus*, food resource partitioning and trophic morphology of, 1102
Brohon, B. (see Guinand, B.), 714
Bromley, P. J. (see Singh-Renton, S.), 702
Brook charr, diel locomotor activity as determined by radiotelemetry, 1174
Brown, B., Benveniste, L. M. and Moller, P., Basal expansion of anal-fin rays: a new osteological character in weakly discharging electric fish (Mormyridae), 1216

Brown, D. (see Krause, J.), 221
Brown, J. A. (see Alkindi, A. Y. A.), 1291
Brown trout, date of smolt migration dependes on body-size but not age in wild sea-run brown trout, 157
Brown trout, direct estimates of the selectivity of a multimesh and series of single gillnets for, 33
Brown trout, food- and habitat-segregation in sympatric grayling and, 301
Brown trout, species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
Buchholz, F. (see Saborowski, R.), 173
Burel, C., Person-Le Ruyet, J., Gaumet, F., Le Roux, A., Sévère, A. and Boeuf, G., Effects of temperature on growth and metabolism in juvenile turbot, 678
Buttle, L. G., Uglow, R. F. and Cowx, I. G., The effect of emersion and handling on the nitrogen excretion rates of *Clarias gariepinus*, 693

Calcium uptake, branchial, diel variation in the rainbow trout, 1034
Caltran, H. and Silan, P., Gill filaments of *Liza ramada*, a biotope for ectoparasites: surface area acquisition using image analysis and growth models, 1267
Cammarata, M. (see Arculeo, M.), 1317
Capoeta Damascina, Barbus longiceps, and their natural sterile hybrid (Teleostei, Cyprinidae), spermatogenetic process in, 458
Carbon and nitrogen, stable isotopes as indicators of diet and trophic structure of the fish community in a shallow hypereutrophic lake, 1233
Cardoso, E. L., Chiarini-Garcia, H., Ferreira, R. M. A. and Poli, C. R., Morphological changes in the gills of *Lophiosilurus alexandri* exposed to un-ionized ammonia, 778
Carp, characterization of thrombocytes with specific monoclonal antibodies, 521
Castillo-Rivera, M. Kobelkowsky, A. and Zamayoa, V., Food resource partitioning and trophic morphology of *Brevoortia gunteri* and *B. patronus*, 1102
Catfish, increased production of docosahexaenoic acid (22: 6 n-3, DHA) when nutritionally stressed by the feeding of oxidized oils and the modulatory effect of dietary α-tocopheryl acetate, 748
Catfishes, comparative ecology of, upper Zambezi River floodplain, 1043
Cavalli, L. and Chappaz, R., Diet, growth and reproduction of the Arctic charr in a high alpine lake, 953
Ceccarelli, P. (see Scocco, P.), 584
Changes in chloride cell distribution during early larval stages of *Clupea harengus*, 801
Channichthyid species, Ovarian development associated with first maturity in three Antarctic species, 1019
Chappaz, R. (see Cavalli, L.), 953
Characterization of carp thrombocytes with specific monoclonal antibodies, 521
Characterization of mitotic chromosomes of four species of the genus *Diplodus*: karyotypes and chromosomal nucleolar organizer region phenotypes, 1128
Charr, Arctic, development of spinal deformities when fed diets supplemented with oxytetracycline, 668
Charr, Arctic, diet, growth and reproduction in a high alpine lake, 953
Charr, benthic and pelagic Arctic, behavioural responses to substratum heterogeneity, 494
Charr, brook, diel locomotor activity as determined by radiotelemetry, 1174
Chiarini-Garcia, H. (see Cardoso, E. L.), 778
Chloride cell distribution, changes during early larval stages of *Clupea harengus*, 801
Chondrostoma nasus embryos, effects of reduced oxygen level on the mortality and hatching rate, 430
Chub, European, spatial aspects of genetic differentiation in the Rhone River basin, 714
Chum salmon, formation of the enveloping layer of the egg in isotonic salt solutions, 895
Clarias gariepinus, effect of emersion and handling on the nitrogen excretion rates of, 693
Clupea harengus, changes in chloride cell distribution during early larval stages of, 801

Cod, Atlantic, Seasonal distribution in the southern Gulf of St Lawrence, 1138
Cod, Atlantic, spawning, oocyte size and structure in relation to blood plasma steroid hormones, individually monitored, 1197
Cod, effects of temperature, prey type and prey size on gastric excretion in, 702
Cod otoliths, validation of back-calculation formulae for, 973
Coho salmon, minisatellite DNA variation and stock identification of, 411
Collart, D. (see Tomasini, J. A.), 594
Collins, J. E. (see Alkindi, A. Y. A.), 1291
Colomba, M. S. (see Vitturi, R.), 1128
Comparative ecology of catfishes of the upper Zambezi River floodplain, 1043
Comparative study of reproductive biology in single- and multiple-spawner cyprinid fish. I. Morphological and histological features, 883
Comparison of food capture and ingestion in juveniles of two flatfish species, *Pleuronectes platessa* and *Limanda limanda* (Teleostei: Pleuronectiformes), 390
Comparisons between the age structures, growth and reproductive biology of two co-occuring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia, 14
Comparisons of faecal collection methods for digestibility determinations in gilthead sea bream, 735
Compensation in individual growth rates and its influence on lake trout population dynamics in the Michigan waters of Lake Superior, 763
Competitive advantage of large body size declines with increasing group size in rainbow trout, 370
Computing expected reproductive success of female Atlantic salmon as a function of smolt size, 877
Conn, W. (see Thomason, J. C.), 739
Conservation of microsatellites in three species of salmonids, 1326
Contractile properties and the inheritance of myosin heavy chains in *Oreochromis* species with different temperature tolerances, 541
Corkwing wrasse, exposure to low temperature and low salinity: survival, blood physiology and seasonal variation, 41
Corkwing wrasse, growth, diet and condition of on the west coast of Scotland, 76
Correlation between environmental parameters and behaviour during high tides in *Periophthalmus modestus*, 139
Cowx, I. G. (see Buttle, L. G.), 693
Crockford, T., Johnston, I. A., McAndrew, B. J. and Mutungi, G., Contractile properties and the inheritance of myosin heavy chains in *Oreochromis* species with different temperature tolerances, 541
Crompton, D. W. T. (see Tierney, J. F.), 483
Crude oil, endocrine, osmoregulatory, respiratory and haematological parameters in flounder exposed to the water soluble fraction of, 1291
Cui, Y., Hung, S. S. O. and Zhu, X., Effect of ration and body size on the energy budget of juvenile white sturgeon, 863
Cumplido, L. R. (see Fernández, F.), 735
Cunjak, R. A. (see Arndt, S. K. A.), 257
Cyprinid fish, comparative study of reproductive biology in single- and multiple-spawner cyprinid fish. I. Morphological and histological features, 883
Cyprinid species, diel feeding patterns and daily ration in the wild determined using an iterative method, MAXIMS, 1153
Cyprinodontid genus *Valencia*, allozymic variation and relationships of and its implications for conservation, 1112

Dab, North Sea, annual changes in the nutritive state of, 173
Date of smolt migration dependes on body-size but not age in wild sea-run brown trout, 157
Davenport, J. (see Bels, V. L.), 390
Davenport, J. (see Sayer, M. D. J.), 64

Davenport, J. (see Thomason, J. C.), 739, 965
Davies, S. J. (see Baker, R. T. M.), 748
De Leenheer, A. (see Merchie, G.), 573
De Silva, S. S., Amarasinghe, U. S. and Wijegoonawardena, N. D. N. S., Diel feeding patterns and daily ration of cyprinid species in the wild determined using an iterative method, MAXIMS, 1153
Deficit of didocosahexaenoyl phospholipid in the eyes of larval sea bass fed an essential fatty acid deficient diet, 941
Dellefors, C. (see Bohlin, T.), 157
Development of spinal deformities in Atlantic salmon and Arctic charr fed diets supplemented with oxytetracycline, 668
Dhert, Ph. (see Merchie, G.), 573
Didocosahexaenoyl phospholipid deficit in the eyes of larval sea bass fed an essential fatty acid deficient diet, 941
Diel feeding patterns and daily ration of cyprinid species in the wild determined using an iterative method, MAXIMS, 1153
Diel locomotor activity of brook charr, as determined by radiotelemetry, 1174
Diel and seasonal distribution of perch in Lake Constance: a hydroacoustic study and *in situ* observations, 1
Diel variation in branchial calcium uptake by the rainbow trout, 1034
Diet, growth and condition of corkwing wrasse and rock cook on the west coast of Scotland, 76
Diet, growth and reproduction of the Arctic charr in a high alpine lake, 953
Diet, stable isotopes of carbon and nitrogen as indicators of diet and trophic structure of the fish community in a shallow hypereutrophic lake, 1233
Dietary ascorbic acid requirements during the hatchery production of turbot larvae, 573
Differences in growth performance between Arcto-Norwegian and Norwegian coastal cod reared under identical conditions, 108
Differences in susceptibility of anadromous and resident stocks of Arctic charr to infections of *Gyrodactylus salaris* under experimental conditions, 341
Digestibility determinations, comparisons of faecal collection method in gilthead sea bream, 735
Diplodus, Characterization of mitotic chromosomes of four species of the genus: karyotypes and chromosomal nucleolar organizer region phenotypes, 1128
Direct estimates of the selectivity of a multimesh and series of single gillnets for brown trout, 33
Distribution and reproduction of the southern lantern shark from New Zealand, 1186
DNA markers, microsatellite, for genetic mapping in *Oreochromis niloticus*, 169
DNA markers, new species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
DNA, minisatellite DNA variation and stock identification of coho salmon, 411
Doadrio, I. (see Perdices, A.), 1112
Docosahexaenoic acid (22: 6 n-3, DHA), increased production in catfish nutritionally stressed by the feeding of oxidized oils and the modulatory effect of dietary α-tocopheryl acetate, 748
Dogfish, lesser spotted, embryonic, ventilatory mechanisms and the effect of hypoxia and temperature on, 965
Dogfish, *Scyliorhinus canicula*, embryonic, effect of temperature and photoperiod on the growth of, 739
Doggertooth predation on immature Pacific salmon, 1323
Douglas, R. H., Goldfish use the visual angle of a familiar landmark to locate a food source, 532
Doyle, R. W. (see Basiao, Z. U.), 277

Eckmann, R. (see Imbrock, F.), 1
Economidis, P. (see Stergiou, K. I.), 561

Ectoparasites, gill filaments of *Liza ramada*, a biotope for: surface area acquisition using image analysis and growth models, 1267
Eel, European, implications of individual growth status on the future sex of, 910
Effect of AC electroshock on blood features in juvenile rainbow trout, 1330
Effect of emersion and handling on the nitrogen excretion rates of *Clarias gariepinus*, 693
Effect of ration and body size on the energy budget of juvenile white sturgeon, 863
Effect of temperature on the optimal substrate for β-oxidation, 753
Effect of temperature and photoperiod on the growth of the embryonic dogfish, *Scyliorhinus canicula*, 739
Effect of temporary reductions in feeding on protein synthesis and energy storage of juvenile Atlantic salmon, 257
Effects of five years of intensive trawling on a previously unexploited smelt stock, 329
Effects of reduced oxygen level on the mortality and hatching rate of *Chondrostoma nasus* embryos, 430
Effects of starvation on plasma free amino acid and glucose concentrations in lake sturgeon, 1306
Effects of temperature on growth and metabolism in juvenile turbot, 678
Effects of temperature, prey type and prey size on gastric excretion in small cod and whiting, 702
Egginton, S. Effect of temperature on the optimal substrate for β-oxidation, 753
Eggs, formation of the enveloping layer of the chum salmon egg in isotonic salt solutions, 895
Electric fish, basal expansion of anal-fin rays: a new osteological character in weakly discharging electric fish (Mormyridae), 1216
Emersion, effect on the nitrogen excretion rates of *Clarias gariepinus*, 693
Emmer, P. M. (see Rombout, J. H. W. M.), 521
Endocrine, osmoregulatory, respiratory and haematological parameters in flounder exposed to the water soluble fraction of crude oil, 1291
Energy storage, juvenile Atlantic salmon, effect of temporary reductions in feeding, 257
Environmental parameters, correlation with behaviour during high tides in *Periophthalmus modestus*, 139
Eosinophilic granulocytes in the epidermis of *Oreochromis mossambicus* gill filaments studied *in situ*, 148
Epithelia, gill, pavement cell ultrastructural differences on *Hoplias malabaricus*, 357
Ermolenko, A. V. (see Shed'ko, S. V.), 815
Estuarine triplefins *Forsterygion nigripenne*, ultrastructure of the glandular epidermis of the fins of male, 95
Euryhaline fish *Peocilia vivipara*, mucous cell types in the branchial epithelium of, 545
Everson, I., Kock, K.-H. and Parkes, G., Ovarian development associated with first maturity in three Antarctic channichthyid species, 1019
Evolutionary and taxonomic relationships among Far-Eastern salmonid fishes inferred from mitochondrial DNA divergence, 815
Exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity: survival, blood physiology and seasonal variation, 41

Fadina, V. A. (see Alikin, Y. S.), 195
Faecal collection methods for digestibility determinations in gilthead sea bream, 735
Faliex, E. (see Sasal, P.), 352
Faremo, U. (see Bohlin, T.), 157
Faria, C., Almada, V. C. and Gonçalves, E. J., Juvenile recruitment, growth and maturation of *Lipophrys pholis* (Pisces: Blenniidae), from the west coast of Portugal, 727
Farrell, A. P. (see Thorarensen, H.), 226
Fatty acids, deficit of didocosahexaenoyl phospholipid in the eyes of larval sea bass fed an essential fatty acid deficient diet, 941
Feeding, effect of temporary reductions on protein synthesis and energy storage of juvenile Atlantic salmon, 257

Feeding and growth, interindividual variations during restricted feeding and in a subsequent period of compensatory growth, 658
Feeding and growth of juvenile sea bass: the effect of ration and temperature on growth rate and efficiency, 206
Female reproductive biology of the sand smelt in brackish lagoons of southern France, 594
Fernandes, M. N. (see Moron, S. E.), 357
Fernández, F., Miquel, A. G., Cumplido, L. R., Guinea, J. and Ros, E., Comparisons of faecal collection methods for digestibility determinations in gilthead sea bream, 735
Ferreira, R. M. A. (see Cardoso, E. L.), 778
Ferreri, C. P. and Taylor, W. W., Compensation in individual growth rates and its influence on lake trout population dynamics in the Michigan waters of Lake Superior, 763
Ferrero, E. A. (see Ota, D.), 246
Fertilization and sperm release behaviour in the grass goby, 246
Fish, J. D. (see Russell, N. R.), 206
Flatfish species, comparison of food capture and ingestion in juveniles of two flatfish species, *Pleuronectes platessa* and *Limanda limanda* (Teleostei: Pleuronectiformes). 390
Flounder, endocrine, osmoregulatory, respiratory and haematological parameters in flounder exposed to the water soluble fraction of crude oil, 1291
Flounder, juvenile, small-scale distribution of in relation to predatory shrimp in a shallow Swedish bay, 1070
Folkvord, A. (see Imsland, A. K.), 926
Food capture and ingestion, a comparison in juveniles of two flatfish species, *Pleuronectes platessa* and *Limanda limanda* (Teleostei: Pleuronectiformes), 390
Food resource partitioning and trophic morphology of *Brevoortia gunteri* and *B. patronus*, 1102
Food- and habitat-segregation in sympatric grayling and brown trout, 301
Formation of the enveloping layer of the chum salmon egg in isotonic salt solutions, 895
Forsterygion nigripenne, ultrastructure of the glandular epidermis of the fins of male, 95

Gaidropsarus mediterraneus (Gadidae), agonistic behaviour and sound production in, 363
Gallaugher, P. E. (see Thorarensen, H.), 226
Gandolfi, G. (see Serventi, M.), 1163
García Ulloa Gómez, M. (see Merchie, G.), 573
Gastric excretion, effects of temperature, prey type and prey size in small cod and whiting, 702
Gastrointestinal responses of rainbow trout to dry pellet and low-fat herring diets, 501
Gaumet, F. (see Burel, C.), 678
Genetic differentiation, spatial aspects of the European chub in the Rhone River basin, 714
Genetic differentiation of white sea bream within the Lion's Gulf and the Ligurian Sea (Mediterranean Sea), 613
Genetic mapping, microsatellite DNA markers for in *Oreochromis niloticus*, 169
Genetic stock identification, assessing seasonal changes in stock composition of Atlantic salmon catches in the Baltic Sea, 998
Gibson, R. N. and Robb, L., Piscine predation on juvenile fishes on a Scottish sandy beach, 120
Gibson, R. N. (see Sayer, M. D. J.), 76
Gill epithelia, pavement cell ultrastructural differences on *Hoplias malabaricus*, 357
Gill filaments of *Liza ramada*, a biotope for ectoparasites: surface area acquisition using image analysis and growth models, 1267
Gillis, T. E. and Ballantyne, J. S., The effects of starvation on plasma free amino acid and glucose concentrations in lake sturgeon, 1306
Gillnets, and a multimesh, selectivity of for brown trout, 33
Gills, morphological changes in *Lophiosilurus alexandri* exposed to un-ionized ammonia, 778

Gilthead sea bream, comparisons of faecal collection methods for digestibility determinations in, 735
Ginatulina, L. K. (see Shed'ko, S. V.), 815
Glandular epidermis of the fins of male estuarine triplefins *Forsterygion nigripenne*, ultrastructure of, 95
Glass, C. W. (see Wardle, C. S.), 854
Glycohistochemistry of the *Tilapia* spp. stomach, 584
Gobies, Ponto-Casopian, vertebral number: phylogenetic relevance, 1027
Gobioid fishes, breeding sounds of male *Padogobius nigricans* with suggestions for evolutionary study of vocal behaviour in gobioid fishes, 648
Gobius bucchichii, population structure in a Mediterranean marine reserve and in an unprotected area, 352
Goby, sand, population dynamics of *Gyrodactylus* sp. (Monogenea) infection in the Oslo Fjord, Norway, 402
Godin, J.-G. J. (see Krause, J.), 221
Godinho, R. (see Almada, V. C.), 363
Goldfish use the visual angle of a familiar landmark to locate a food source, 532
Goldsinny, exposure to low temperature and low salinity: survival, blood physiology and seasonal variation, 41
Goldsinny wrasse, torpid, hypometabolism when subjected to rapid reductions in seawater temperature, 64
Gonçalves, D. M. (see Gonçalves, E. J.), 367
Gonçalves, E. J., Almada V. C., Almeida, S. P., Gonçalves, D. M., Repas, M. and Simões, N., Observations on the agonistic behaviour of *Lepadogaster lepadogaster purpurea* (Pisces: Gobiesocidae), 367
Gonçalves, E. J. (see Faria, C.), 727
Gordon, M. S., Plaut, I. and Kim, D., How puffers (Teleostei: Tetraodontidae) swim, 319
Görlich, A. (see Kilarski, W. M.), 1280
Granulocytes, eosinophilic, in the epidermis of *Oreochromis mossambicus* gill filaments studied *in situ*, 148
Grass goby, sperm release behaviour and fertilization in the, 246
Grayling, food- and habitat-segregation in sympatric grayling and brown trout, 301
Gregory, J. S. and Griffith, J. S., Aggressive behaviour of underyearling rainbow trout in simulated winter concealment habitat, 237
Griffith, J. S. (see Gregory, J. S.), 237
Grosh, R. S. (see Barton, B. A.), 1330
Gross, R., Nilsson, J. and Schmitz, M., A new species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
Group size, competitive advantage of large body size declines with increasing group size in rainbow trout, 370
Grove, D. J. (see Ruohonen, K.), 501
Growth, age structures and reproductive biology of two co-occurring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia, 14
Growth, bias associated with the dispersion of length at age in the estimation of growth and mortality parameters from uni-modal length–frequency data, 743
Growth, compensation in individual growth rates and its influence on lake trout population dynamics in the Michigan waters of Lake Superior, 763
Growth, diet and condition of corkwing wrasse and rock cook on the west coast of Scotland, 76
Growth, diet and reproduction of the Arctic charr in a high alpine lake, 953
Growth, effect of temperature and photoperiod in the embryonic dogfish, *Scyliorhinus canicula*, 739
Growth, effects of temperature in juvenile turbot, 678

Growth and feeding, interindividual variations during restricted feeding and in a subsequent period of compensatory growth, 658
Growth and feeding of juvenile sea bass: the effect of ration and temperature on growth rate and efficiency, 206
Growth, implications of individual growth status on the future sex of the European eel, 910
Growth, interaction of temperature and fish size in juvenile turbot, 926
Growth, maturation and juvenile recruitment of *Lipophrys pholis* (Pisces: Blenniidae), from the west coast of Portugal, 727
Growth performance differences between Arcto-Norwegian and Norwegian coastal cod reared under identical conditions, 108
Growth, statistical power analysis of the 'internal reference' technique for comparing growth and growth depensation of tilapia strains, 277
Gu, B., Schleske, C. L. and Hoyer, M. V., Stable isotopes of carbon and nitrogen as indicators of diet and trophic structure of the fish community in a shallow hypereutrophic lake, 1233
Guerrero, G. A. (see Lo Nostro, F. L.), 788
Guinand, B., Bouvet, Y. and Brohon, B., Spatial aspects of genetic differentiation of the European chub in the Rhone River basin, 714
Guinea, J. (see Fernández, F.), 735
Gulf of St Lawrence, seasonal distribution of juvenile Atlantic cod in, 1138
Guppy, isolation and the development of shoaling in two populations of, 514
Gut evacuation and absorption efficiency of walleye larvae, 375
Guyomard, R. (see Presa, P.), 1326
Gyrodactylus salaris, differences in susceptibility of anadromous and resident stocks of Arctic charr to infections of, 341
Gyrodactylus sp. (Monogenea), population dynamics of, infecting the sand goby in the Oslo Fjord, Norway, 402

Habitat-segregation in sympatric grayling and brown trout, 301
Handling, effect on the nitrogen excretion rates of *Clarias gariepinus*, 693
Handling, metabolic responses to by fingerling inland and anadromous striped bass, 830
Hanson, J. M., Seasonal distribution of juvenile Atlantic cod in the southern Gulf of St Lawrence, 1138
Harris, P. D. (see Bakke, T. A.), 341
Harrison, I. J. (see Serventi, M.), 1163
Hartney, K. B., Site fidelity and homing behaviour of some kelp-bed fishes, 1062
Haugen, T. O., and Rygg, T. A., Food- and habitat-segregation in sympatric grayling and brown trout, 301
Heart rate, limitations of as a predictor of metabolic rate in fish, 226
Heath, A. G. (see Reubush, K. J.), 830
Hernandez-Blazquez, F. J. (see Sabóia-Moraes, S. M. T.), 545
Hesthagen, T. (see Jensen, J. W.), 33
High tides, correlation between environmental parameters and behaviour during high tides in *Periophthalmus modestus*, 139
Holm, J. C. (see Smedstad, O. M.), 973
Holmgren, K. and Mosegaard, H., Implications of individual growth status on the future sex of the European eel, 910
Hoplias malabaricus, pavement cell ultrastructural differences on gill epithelia, 357
Horppila, J., Nyberg, K., Peltonen, H. and Turunen, T., Effects of five years of intensive trawling on a previously unexploited smelt stock, 329
Horse mackerel, measurements of aerobic metabolism at different swimming speeds, 854
How puffers (Teleostei: Tetraodontidae) swim, 319
Hoyer, M. V. (see Gu, B.), 1233
Hung, S. S. O. (see Cui, Y.), 863
Huntingford, F. A. (see Mikheev, V. N.), 494
Huntingford, F. A. (see Tierney, J. F.), 483

Huusko, A., Vuorimies, O. and Sutela, T., Temperature- and light-mediated predation by perch on vendace larvae, 441
Hybrids, species-specific nuclear DNA marker for identificaiton of hybrids between Atlantic salmon and brown trout, 537
Hyndes, G. A. and Potter, I. C., Comparisons between the age structures, growth and reproductive biology of two co-occuring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia, 14
Hypometabolism in torpid goldsinny wrasse subjected to rapid reductions in seawater temperature, 64
Hypoxia, effect on the embryonic lesser spotted dogfish, 965

Ikebe, Y. and Oishi, T., Correlation between environmental parameters and behaviour during high tides in *Periophthalmus modestus*, 139
Imbrock, F., Appenzeller, A. and Eckmann, R., Diel and seasonal distribution of perch in Lake Constance: a hydroacoustic study and *in situ* observations, 1
Implications of individual growth status on the future sex of the European eel, 910
Imsland, A. K., Sunde, L. M., Folkvord, A. and Stefansson, S. O., The interaction of temperature and fish size on growth of juvenile turbot, 926
Increased production of docosahexaenoic acid (22: 6 n-3, DHA) in catfish nutritionally stressed by the feeding of oxidized oils and the modulatory effect of dietary α-tocopheryl acetate, 748
Ingestion and food capture, a comparison in juveniles of two flatfish species, *Pleuronectes platessa* and *Limanda limanda* (Teleostei: Pleuronectiformes), 390
Interaction of temperature and fish size on growth of juvenile turbot, 926
Interindividual variations in feeding and growth in rainbow trout during restricted feeding and in a subsequent period of compensatory growth, 658
'Internal reference' technique for comparing growth and growth depensation of tilapia strains, statistical power analysis, 277
Isolation and the development of shoaling in two populations of the guppy, 514
Italian mullet fry, use of pigmentation and morphological characters to identify, 1163

James, M. A. (see Northcott, S. J.), 95
Jansen, P. A. (see Bakke, T. A.), 341
Jensen, J. W. and Hesthagen, T., Direct estimates of the selectivity of a multimesh and series of single gillnets for brown trout, 33
Jobling, M. and Koskela, J., Interindividual variations in feeding and growth in rainbow trout during restricted feeding and in a subsequent period of compensatory growth, 658
Jobling, M. (see Toften, H.), 668
Johnsson, J. I. (see Pettersson, J.), 370
Johnston, I. A. (see Crockford, T.), 541
Johnston, I. A. (see Vieira, V. L. A.), 842
Johnston, T. A. and Mathias, A., Gut evacuation and absorption efficiency of walleye larvae, 375
Johnstone, A. D. F. (see Wardle, C. S.), 854
Jørstad, K. E. (see Svåsand, T.), 108
Juvenile fish, and adults, relationship between body weight and natural mortality: a comparison of natural ecosystems and aquaculture, 627
Juvenile fishes, piscine predation, on a Scottish sandy beach, 120
Juvenile rainbow trout, effect of AC electroshock on blood features, 1330
Juvenile recruitment, growth and maturation of *Lipophrys pholis* (Pisces: Blenniidae), from the west coast of Portugal, 727
Juvenile sea bass, feeding and growth: the effect of ration and temperature on growth rate and efficiency, 206
Juvenile turbot, effects of temperature on growth and metabolism, 678
Juvenile turbot, interaction of temperature and fish size on growth of, 926

Juveniles, two flatfish species *Limanda limanda* and *Pleuronectes platessa* (Teleostei: Pleuronectiformes), comparison of food capture and ingestion, 390

Kamler, E. (see Keckeis, H.), 430
Keckeis, H., Bauer-Nemeschkal, E. and Kamler, E., Effects of reduced oxygen level on the mortality and hatching rate of *Chondrostoma nasus* embryos, 430
Kelpbed fishes, site fidelity and homing behaviour, 1062
Kelso-Winemiller, L. C. (see Winemiller, K. O.), 1043
Kestemont, P. (see Rinchard, J.), 883
Kilarski, W. M., Romek, M., Kozlowska, M. and Görlich, A., Short-term thermal acclimation induces adaptive changes in the inner mitochondrial membranes of fish skeletal muscle, 1280
Kim, D. (see Gordon, M. S.), 319
Kjesbu, O. S., Kryvi, H. and Norberg, B., Oocyte size and structure in relation to blood plasma steroid hormones in individually monitored, spawning Atlantic cod, 1197
Kjesbu, O. S. (see Svåsand, T.), 108
Klimenko, V. P. (see Alikin, Y. S.), 195
Knoph, M. B. and Måsøval, K., Plasma ammonia and urea levels in Atlantic salmon farmed in sea water, 165
Kobayashi, W. (see Yamamoto, T. S.), 895
Kocher, (see Lee, W.-J.), 169
Kock, K.-H. (see Everson, I.), 1019
Koljonen, M.-L. and McKinnell, S., Assessing seasonal changes in stock composition of Atlantic salmon catches in the Baltic Sea with genetic stock identification, 998
Koskela, J. (see Jobling, M.), 658
Koumans-van Diepen, J. C. E. (see Rombout, J. H. W. M.), 521
Kozlowska, M. (see Kilarski, W. M.), 1280
Krause, J., Godin, J.-G. J. and Brown, D., Size-assortativeness in multi-species fish shoals, 221
Kryvi, H. (see Kjesbu, O. S.), 1197
Kupinskaya, O. A. (see Alikin, Y. S.), 195

Lacroix, G. L. and McCurdy, P., Migratory behaviour of post-smolt Atlantic salmon during initial stages of seaward migration, 1086
Lake Constance, diel and seasonal distribution of perch: a hydroacoustic study and *in situ* observations, 1
Lake sturgeon, effects of starvation on plasma free amino acid and glucose concentrations in, 1306
Lake Superior, compensation in individual growth rates and its influence on lake trout population dynamics in, 763
Lake Tana, Ethiopia, reproductive segregation among the *Barbus intermedius* complex of. An example of intralacustrine speciation?, 1244
Lantern shark, southern, New Zealand, distribution and reproduction, 1186
Larvae, changes in chloride cell distribution during early larval stages of *Clupea harengus*, 801
Larvae, turbot, dietary ascorbic acid requirements during the hatchery production of, 573
Larvae, walleye, gut evacuation and absorption efficiency of, 375
Lavens, P. (see Merchie, G.), 573
Le Comte, E. (see Thomason, J. C.), 739, 965
Le Roux, A. (see Burel, C.), 678
Lee, W.-J. and Kocher, T. D., Microsatellite DNA markers for genetic mapping in *Oreochromis niloticus*, 169
Lenfant, P. and Planes, S., Genetic differentiation of white sea bream within the Lion's Gulf and the Ligurian Sea (Mediterranean Sea), 613
Length, bias associated with the dispersion of length at age in the estimation of growth and mortality parameters from uni-modal length–frequency data, 743

Length/weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia, 731
Lepadogaster lepadogaster purpurea (Pisces: Gobiesocidae), agonistic behaviour of, 367
Libertini, A. (see Vitturi, R.), 1128
Light- and temperature-mediated predation by perch on vendace larvae, 441
Limanda limanda and *Pleuronectes platessa* (Teleostei: Pleuronectiformes), comparison of food capture and ingestion in juveniles of two flatfish species, 390
Limitations of heart rate as a predictor of metabolic rate in fish, 226
Line capture, stress responses in the blue mao mao, 287
Lipophrys pholis (Pisces: Blenniidae), from the west coast of Portugal, juvenile recruitment, growth and maturation, 727
Livingstone, D. R. (see Peters, L. D.), 986
Liza ramada gill filaments of, a biotope for ectoparasites: surface area acquisition using image analysis and growth models, 1267
Lo Brutto, S. (see Arculeo, M.), 1317
Lo Nostro, F. L. and Guerrero, G. A., Presence of primary and secondary males in a population of the protogynous *Synbranchus marmoratus*, 788
Lophiosilurus alexandri morphological changes in the gills when exposed to un-ionized ammonia, 778
Lorenzen, K., The relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture, 627
Lowe, T. E. and Wells, R. M. G., Primary and secondary stress responses to line capture in the blue mao mao, 287
Lugli, M., Torricelli, P., Pavan, G. and Miller, P. J., Breeding sounds of male *Padogobius nigricans* with suggestions for further evolutionary study of vocal behaviour in gobioid fishes, 648

McAndrew, B. J. (see Crockford, T.), 541
McCurdy, P. (see Lacroix, G. L.), 1086
McEvoy, L. A. (see Bell, M. V.), 941
Machordom, A. (see Perdices, A.), 1112
McKinnell, S. (see Koljonen, M.-L), 998
McKinnon, J. S., Red coloration and male parental behaviour in the threespine stickleback, 1030
Magnan, P. (see Bourke, P.), 1174
Males, primary and secondary, presence in a population of the protogynous *Synbranchus marmoratus*, 788
Mangel, M., Computing expected reproductive success of female Atlantic salmon as a function of smolt size, 877
Mao mao, blue, primary and secondary stress responses to line capture in, 287
Marchesan, M. (see Ota, D.), 246
Martin-Smith, K. M., Length/weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia, 731
Måsøval, K. (see Knoph, M. B.), 165
Masycheva, V. I. (see Alikin, Y. S.), 195
Mathias, A. (see Johnston, T. A.), 375
Matos, R. (see Almada, V. C.), 363
Maturation, growth and and juvenile recruitment of *Lipophrys pholis* (Pisces: Blenniidae), from the west coast of Portugal, 727
Mauro, A. (see Arculeo, M.), 1317
Mazzola, A. (see Vitturi, R.), 1128
Measurements of aerobic metabolism of a school of horse mackerel at different swimming speeds, 854
Menghi, G. (see Scocco, P.), 584
Merchie, G., Lavens, P., Dhert, Ph., García Ulloa Gómez, M., Nelis, H., De Leenheer, A. and Sorgeloos, P., Dietary ascorbic acid requirements during the hatchery production of turbot larvae, 573

Metabolic rate, limitations of heart rate as predictor of, 226
Metabolic responses to acute handling by fingerling inland and anadromous striped bass, 830
Metabolism, effects of temperature in juvenile turbot, 678
Microsatellites, conservation of in three species of salmonids, 1326
Microsatellite DNA markers for genetic mapping in *Oreochromis niloticus*, 169
Migration, smolt, date of depends on body-size but not age in wild sea-run brown trout, 157
Migratory behaviour of post-smolt Atlantic salmon during initial stages of seaward migration, 1086
Mikheev, V. N., Adams, C. E., Huntingford, F. A. and Thorpe, J. E., Behavioural responses of benthic and pelagic Arctic charr to substratum heterogeneity, 494
Miller, K. M. (see Beacham, T. D.), 411
Miller, P. J. (see Lugli, M.), 648
Minisatellite DNA variation and stock identification of coho salmon, 411
Miquel, A. G. (see Fernández, F.), 735
Mirandi, A. (see Nordlie, F. G.), 1226
Mitochondrial DNA, divergence, evolutionary and taxonomic relationships among Far-Eastern salmonid fishes inferred from, 815
Mitochondrial membranes, fish skeletal muscle, short-term thermal acclimation induces adaptive changes in, 1280
Mitotic chromosomes of four species of the genus *Diplodus*, characterization of: karyotypes and chromosomal nucleolar organizer region phenotypes, 1128
Modin, J. and Pihl, L., Small-scale distribution of juvenile plaice and flounder in relation to predatory shrimp in a shallow Swedish bay, 1070
Moller, P. (see Brown, B.), 1216
Monoclonal antibodies, characterization of carp thrombocytes with specific, 521
Morand, S. (see Sasal, P.), 352
Moron, S. E. and Fernandes, M. N., Pavement cell ultrastructural differences on *Hoplias malabaricus* gill epithelia, 357
Morphological changes in the gills of *Lophiosilurus alexandri* exposed to un-ionized ammonia, 778
Mortality, natural, relationship to body weight in juvenile and adult fish: a comparison of natural ecosystems and aquaculture, 627
Mosegaard, H. (see Holmgren, K.), 910
Mosquitofish, eastern, salinity relationships in a freshwater population of, 1226
Mota, D. L. (see Sabóia-Moraes, S. M. T.), 545
Mucous cell types in the branchial epithelium of the euryhaline fish *Poecilia vivipara*, 545
Mugiya, Y. (see Tahara, D.), 1034
Mullet fry, Italian, use of pigmentation and morphological characters to identify, 1163
Multimesh and series of single gillnets for brown trout, selectivitiy of, 33
Muscle development in the tambaqui, an important Amazonian food fish, 842
Mutungi, G. (see Crockford, T.), 541
Myosin heavy chaines, contractile properties and the inheritance of in *Oreochromis* species with different temperature tolerances, 541

Nagelkerke, L. A. J. and Sibbing, F. A., Reproductive segregation among the *Barbus intermedius* complex of Lake Tana, Ethiopia. An example of intralacustrine speciation?, 1244
Navarro, J. C. (see Bell, M. V.), 941
Nelis, H. (see Merchie, G.), 573
New species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
Nikolić, V. P. (see Simonović, P. D.), 1027
Nilsson, J. (see Gross, R.), 537
Nitrogen excretion rates, effect of emersion and handling in *Clarias gariepinus*, 693
Norberg, B. (see Kjesbu, O. S.), 1197

Nordlie, F. G. and Mirandi, A., Salinity relationships in a freshwater population of eastern mosquitofish, 1226
North Sea dab, annual changes in the nutritive state of, 173
Northcott, S. J. and James, M. A., Ultrastructure of the glandular epidermis of the fins of male estuarine triplefins *Forsterygion nigripenne*, 95
Norwegian and Arcto-Norwegian coastal cod reared under identical conditions, differences in growth performance, 108
Nuclear DNA marker, new species specific for identification of hybrids between Atlantic salmon and brown trout, 537
Nutritive state of North Sea dab, annual changes, 173
Nyberg, K. (see Horppila, J.), 329

Observations on the agonistic behaviour of *Lepadogaster lepadogaster purpurea* (Pisces: Gobiesocidae), 367
Oil, crude, endocrine, osmoregulatory, respiratory and haematological parameters in flounder exposed to the water soluble fraction of, 1291
Oishi, T. (see Ikebe, Y.), 139
O'Neill, F. G. (see Wardle, C. S.), 854
Oocyte size and structure in relation to blood plasma steroid hormones in individually monitored, spawning Atlantic cod, 1197
Oreochromis mossambicus, Eosinophilic granulocytes in the epidermis of gill filaments studied *in situ*, 148
Oreochromis niloticus, microsatellite DNA markers for genetic mapping in, 169
Oreochromis species, contractile properties and the inheritance of myosin heavy chains in, with different temperature tolerances, 541
Orte, C. (see Barnett, R. R.), 148
Oslo Fjord, Norway, population dynamics of *Gyrodactylus* sp. (Monogenea) infecting the sand goby in, 402
Ota, D., Marchesan, M. and Ferrero, E. A., Sperm release behaviour and fertilization in the grass goby, 246
Otoliths, cod, validation of back-calculation formulae, 973
Otterå, H. (see Svåsand, T.), 108
Ovarian development associated with first maturity in three Antarctic channichthyid species, 1019
Oxygen, effects of reduced level on the mortality and hatching rate of *Chondrostoma nasus* embryos, 430
Oxytetracycline, development of spinal deformities in Atlantic salmon and Arctic charr fed diets supplemented with, 668

Pacific salmon, immature, predation of doggertooth on, 1323
Padogobius nigricans, breedings sounds of male, 648
Parkes, G. (see Everson, I.), 1019
Parpura, I. Z. (see Shed'ko, S. V.), 815
Parrinello, N. (see Arculeo, M.), 1317
Pavan, G. (see Lugli, M.), 648
Pavement cell ultrastructural differences on *Hoplias malabaricus* gill epithelia, 357
Paxton, C. G. M., Isolation and the development of shoaling in two populations of the guppy, 514
Pelagic Arctic charr, behavioural responses to substratum heterogeneity, 494
Peltonen, H. (see Horppila, J.), 329
Peocilia vivipara, mucous cell types in the branchial epithelium of, 545
Perch, diel and seasonal distribution in Lake Constance: a hydroacoustic study and *in situ* observations, 1
Perch, temperature- and light-mediated predation by perch on vendace larvae, 441
Perdices, A., Machordom, A. and Doadrio, I., Allozymic variation and relationships of the endangered cyprinodontid genus *Valencia* and its implications for conservation, 1112

Pereíra, F. (see Almada, V. C.), 363
Periophthalmus modestus, correlation between environmental parameters and behaviour during high tides, 139
Person-Le Ruyet, J. (see Burel, C.), 678
Peters, L. D. and Livingstone, D. R., Antioxidant enzyme activities in embryologic and early larval stages of turbot, 986
Pettersson, J., Johnsson, J. I. and Bohlin, T., The competitive advantage of large body size declines with increasing group size in rainbow trout, 370
Philippart, J. C. (see Poncin, P.), 622
Photoperiod, effect on the growth of the embryonic dogfish, *Scyliorhinus canicula*, 739
Phylogenetic relevance, vertebral number in Ponto-Caspian gobies, 1027
Pihl, L. (see Modin, J.), 1070
Pisces: Gobiesocidae (*Lepadogaster lepadogaster purpurea*), agonistic behaviour of, 367
Piscine predation on juvenile fishes on a Scottish sandy beach, 120
Plaice, juvenile, small-scale distribution of in relation to predatory shrimp in a shallow Swedish bay, 1070
Planes, S. (see Lenfant, P.), 613
Plasma ammonia and urea levels in Atlantic salmon farmed in sea water, 165
Plaut, I. (see Gordon, M. S.), 319
Pleuronectes platessa and *Limanda limanda* (Teleostei: Pleuronectiformes), comparison of food capture and ingestion in juveniles of two flatfish species, 390
Poli, C. R. (see Cardoso, E. L.), 778
Poncin, P. Philippart, J. C. and Ruwet, J. C., Territorial and non-territorial spawning behaviour in the bream, 622
Population dynamics of *Gyrodactylus* sp. (Monogenea) infecting the sand goby in the Oslo Fjord, Norway, 402
Population structure of *Gobius bucchichii* in a Mediterranean marine reserve and in an unprotected area, 352
Potter, I. C. (see Hyndes, G. A.), 14
Predation of doggertooth on immature Pacific salmon, 1323
Predation, temperature-and light-mediated, by perch on vendace larvae, 441
Predicting biomass of Atlantic salmon from morphometric lateral measurements, 469
Presa, P. and Guyomard, R., Conservation of microsatellites in three species of salmonids, 1326
Presence of primary and secondary males in a population of the protogynous *Synbranchus marmoratus*, 788
Prey type and size, effects on gastric excretion in small cod and whiting, 702
Primary and secondary stress responses to line capture in the blue mao mao, 287
Prophylactic treatment of viral diseases in fish using native RNA linked to soluble and corpuscular carriers, 195
Protein differences among the Mediterranean species of the genus *Spicara*, 1317
Protein synthesis, effect of temporary reductions in feeding on, juvenile Atlantic salmon, 257
Puffers (Teleostei: Tetraodontidae), how they swim, 319

Quignard, J. P. (see Tomasini, J. A.), 594

Radchenko, V. I. and Semenchenko, A. Yu., Predation of doggertooth on immature Pacific salmon, 1323
Radiotelemetry, determination of diel locomotor activity of brook charr, 1174
Rainbow trout, aggressive behaviour of underyearlings in simulated winter concealment habitat, 237
Rainbow trout, competitive advantage of large body size declines with increasing group size, 370
Rainbow trout, diel variation in branchial calcium uptake by, 1034
Rainbow trout, gastrointestinal responses to dry pellet and low-fat herring diets, 501

Rainbow trout, interindividual variations in feeding and growth during restricted feeding and in a subsequent period of compensatory growth, 658
Rainbow trout, juvenile, effect of AC electroshock on blood features in, 1330
Ration, effect on the energy budget of juvenile white sturgeon, 863
Reader, J. P. (see Sayer, M. D. J.), 41
Red bandfish in the western Aegean Sea, sex ratio, spawning season and size at maturity of, 561
Red coloration and male parental behaviour in the threespine stickleback, 1030
Relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture, 627
Relationship between first vertebra width and body length of Atlantic salmon differs between parr and smolts, 1038
Repas, M. (see Gonçalves, E. J.), 367
Reproduction, diet and growth of the Arctic charr in a high alpine lake, 953
Reproductive biology, comparative study in single- and multiple-spawner cyprinid fish. I. Morphological and histological features, 883
Reproductive biology, female, the sand smelt in brackish lagoons of southern France, 594
Reproductive biology, growth and age structures of two co-occurring sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia, 14
Reproductive segregation among the *Barbus intermedius* complex of Lake Tana, Ethiopia. An example of intralacustrine speciation?, 1244
Reproductive status and body condition in sticklebacks exposed to a single wave of *Schistocephalus solidus* infection, 483
Reubush, K. J. and Heath, A. G., Metabolic responses to acute handling by fingerling inland and anadromous striped bass, 830
Rinchard, J. and Kestemont, P., Comparative study of reproductive biology in single- and multiple-spawner cyprinid fish. I. Morphological and histological features, 883
Robb, L. (see Gibson R. N.), 120
Rock cook, exposure to low temperature and low salinity: survival, blood physiology and seasonal variation, 41
Rock cook, growth, diet and condition of on the west coast of Scotland, 76
Rodriguez, M. A. (see Bourke, P.), 1174
Rombout, J. H. W. M., Koumans-van Diepen, J. C. E., Emmer, P. M., Taverne-Thiele, J. J. and Taverne, N., Characterization of carp thrombocytes with specific monoclonal antibodies, 521
Romek, M. (see Kilarski, W. M.), 1280
Ros, E. (see Fernández, F.), 735
Ross, L. G. (see Beddow, T. A.), 469
Ruohonen, K. and Grove, D. J., Gastrointestinal responses of rainbow trout to dry pellet and low-fat herring diets, 501
Russell, N. R., Fish, J. D. and Wootton, R. J., Feeding and growth of juvenile sea bass: the effect of ration and temperature on growth rate and efficiency, 206
Ruwet, J. C. (see Poncin, P.), 622
Rygg, T. A. (see Haugen, T. O.), 301

Sabah, Malaysia, length/weight relationships of fishes in a diverse tropical freshwater community, 731
Sabóia-Moraes, S. M. T., Hernandez-Blazquez, F. J., Mota, D. L. and Bittencourt, A. M., Mucous cell types in the branchial epithelium of the euryhaline fish *Poecilia vivipara*, 545
Saborowski, R. and Buchholz, F., Annual changes in the nutritive state of North Sea dab, 173
Salinity, exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity, 41
Salinity relationships in a freshwater population of eastern mosquitofish, 1226
Salmon, Atlantic, assessing seasonal changes in stock composition of catches in the Baltic Sea with genetic stock identification, 998

Salmon, Atlantic, development of spinal deformities when fed diets supplemented with oxytetracycline, 668
Salmon, Atlantic, effect of temporary reductions in feeding on protein synthesis and energy storage of, 257
Salmon, Atlantic, female, computing expected reproductive success as a function of smolt size, 877
Salmon, Atlantic, migratory behaviour of post-smolt Atlantic salmon during initial stages of seaward migration, 1086
Salmon, Atlantic, plasma ammonia and urea levels in Atlantic salmon farmed in sea water, 165
Salmon, Atlantic, predicting biomass of from morphometric lateral measurements, 469
Salmon, Atlantic, relationship between first vertebra width and body length differs between parr and smolts, 1038
Salmon, Atlantic, species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
Salmon, chum, formation of the enveloping layer of the egg in isotonic salt solutions, 895
Salmon, coho, minisatellite DNA variation and stock identification of, 411
Salmon, Pacific, immature, predation of doggertooth on, 1323
Salmonid fishes, evolutionary and taxonomic relationships among Far-Eastern salmonid fishes inferred from mitochondrial DNA divergence, 815
Salmonids, conservation of microsatellites in three species of, 1326
Sand goby, population dynamics of *Gyrodactylus* sp. (Monogenea) infection in the Oslo Fjord, Norway, 402
Sand smelt in brackish lagoons of southern France, female reproductive biology, 594
Sara, G. (see Vitturi, R.), 1128
Sasal, P., Faliex, E. and Morand, S., Population structure of *Gobius bucchichii* in a Mediterranean marine reserve and in an unprotected area, 352
Sayer, M. D. J. and Davenport, J., Hypometabolism in torpid goldsinny wrasse subjected to rapid reductions in seawater temperature, 64
Sayer, M. D. J. and Reader, J. P., Exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity: survival, blood physiology and seasonal variation, 41
Sayer, M. D. J., Gibson, R. N. and Atkinson, R. J. A., Growth, diet and condition of corkwing wrasse and rock cook on the west coast of Scotland, 76
Scelsa, G. (see Arculeo, M.), 1317
Schistocephalus solidus, body condition and reproductive status in sticklebacks exposed to a single wave of infection by, 483
Schleske, C. L. (see Gu, B.), 1233
Schmitz, M. (see Gross, R.), 537
Scocco, P., Ceccarelli, P. and Menghi, G., Glycohistochemistry of the *Tilapia* spp. stomach, 584
Scotland, growth, diet and condition of corkwing wrasse and rock cook on the west coast of, 76
Scyliorhinus canicula, embryonic, effect of temperature and photoperiod on the growth of, 739
Sea bass, juvenile, feeding and growth: the effect of ration and temperature on growth rate and efficiency, 206
Sea bass, larval, didocosahexaenoyl phospholipid deficit in the eyes of larval sea bass fed an essential fatty acid deficient diet, 941
Sea bream, gilthead, comparisons of faecal collection methods for digestibility determinations in, 735
Sea bream, white, genetic differentiation within the Lion's Gulf and the Ligurian Sea (Mediterranean Sea), 613
Seasonal distribution of juvenile Atlantic cod in the southern Gulf of St Lawrence, 1138
Seasonal variation, exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity: survival, blood physiology and, 41
Selectivity of a multimesh and series of single gillnets for brown trout, 33

SEMENCHENKO, A. YU. (see RADCHENKO, V. I.), 1323
SERVENTI, M., HARRISON, I. J., TORRICELLI, P. and GANDOLFI, G., The use of pigmentation and morphological characters to identify Italian mullet fry, 1163
SÉVÈRE, A. (see BUREL, C.), 678
Sex ratio, spawning season and size at maturity of red bandfish in the western Aegean Sea, 561
Shark, southern lantern, New Zealand, distribution and reproduction, 1186
SHCHELKUNOV, I. S. (see ALIKIN, Y. S.), 195
SHCHELKUNOVA, T. I. (see ALIKIN, Y. S.), 195
SHED'KO, S. V., GINATULINA, L. K., PARPURA, I. Z. and ERMOLENKO, A. V., Evolutionary and taxonomic relationships among Far-Eastern salmonid fishes inferred from mitochondrial DNA divergence, 815
SHEPHARD, K. L. (see BARNETT, R. R.), 148
Shoaling, isolation and the development of shoaling in two populations of the guppy, 514
Shoals, multi-species, size-assortativeness in, 221
Short-term thermal acclimation induces adaptive changes in the inner mitochondrial membranes of fish skeletal muscle, 1280
Shrimp, predatory, small-scale distribution of juvenile plaice and flounder in relation to predatory shrimp in a shallow Swedish bay, 1070
SIBBING, F. A. (see NAGELKERKE, L. A. J.), 1244
SILAN, P. (see CALTRAN, H.), 1267
Sillaginids, *Sillago robusta* and *S. bassensis*, in temperate coastal waters of Australia, comparison of age structures, growth and reproductive biology, 14
SIMÕES, N. (see GONÇALVES, E. J.), 367
SIMONOVIĆ, P. D., NIKOLIĆ, V. P. and SKORA, K. E., Vertebral number in Ponto-Caspian gobies: phylogenetic relevance, 1027
SINGH-RENTON, S. and BROMLEY, P. J., Effects of temperature, prey type and prey size on gastric excretion in small cod and whiting, 702
SINIS, A. (see STERGIOU, K. I.), 561
Site fidelity and homing behaviour of some kelp-bed fishes, 1062
Size at maturity, spawning season and sex ratio of red bandfish in the western Aegean Sea, 561
Size, interaction with temperature on growth of juvenile turbot, 926
Size-assortativeness in multi-species fish shoals, 221
SKORA, K. E. (see SIMONOVIĆ, P. D.), 1027
Small-scale distribution of juvenile plaice and flounder in relation to predatory shrimp in a shallow Swedish bay, 1070
SMEDSTAD, O. M. and HOLM, J. C., Validation of back-calculation formulae for cod otoliths, 973
Smelt, sand, in brackish lagoons of southern France, female reproductive biology, 594
Smelt stock, effects of five years of intensive trawling on, 329
Smolt migration, date of depends on body-size but not age in wild sea-run brown trout, 157
Smolt size, computing expected reproductive success of female Atlantic salmon as a function of, 877
SOOFIANI, N. M. (see WARDLE, C. S.), 854
SORGELOOS, P. (see MERCHIE, G.), 573
Sound production and agonistic behaviour in *Gaidropsarus mediterraneus* (Gadidae), 363
Southern lantern shark, New Zealand, distribution and reproduction, 1186
Spatial aspects of genetic differentiation of the European chub in the Rhone River basin, 714
Spawning behaviour in the bream, territorial and non-territorial, 622
Spawning season, sex ratio and size at maturity of red bandfish in the western Aegean Sea, 561
Sperm release behaviour and fertilization in the grass goby, 246
Spermatogenetic process in *Barbus longiceps, Capoeta damascina* and their natural sterile hybrid (Teleostei, Cyprinidae), 458

Spicara genus, protein differences among the Mediterranean species of, 1317
Spinal deformities, development in Atlantic salmon and Arctic charr fed diets supplemented with oxytetracycline, 668
Stable isotopes of carbon and nitrogen as indicators of diet and trophic structure of the fish community in a shallow hypereutrophic lake, 1233
Starvation, effects on plasma free amino acid and glucose concentrations in lake sturgeon, 1306
Statistical power analysis of the 'internal reference' technique for comparing growth and growth depensation of tilapia strains, 277
Stefansson, S. O. (see Imsland, A. K.), 926
Stergiou, K. I., Economidis, P. and Sinis, A., Sex ratio, spawning season and size at maturity of red bandfish in the western Aegean Sea, 561
Steroid hormones, blood plasma, in relation to oocyte size and structure in individually monitored, spawning Atlantic cod, 1197
Stewart, D. C. (see Armstrong, J. D.), 1038
Stickleback, threespine, red coloration and male parental behaviour in, 1030
Sticklebacks, body condition and reproductive status in sticklebacks exposed to a single wave of *Schistocephalus solidus* infection, 483
Stock identification and minisatellite DNA variation of coho salmon, 411
Stomach, glycohistochemistry of the *Tilapia* spp., 584
Stoumboudi, M. Th. and Abraham, M., The spermatogenetic process in *Barbus longiceps, Capoeta Damascina* and their natural sterile hybrid (Teleostei, Cyprinidae), 458
Stress responses to line capture in the blue mao mao, 287
Striped bass, metabolic responses to acute handling by fingerling inland and anadromous, 830
Sturgeon, lake, effects of starvation on plasma free amino acid and glucose concentrations in, 1306
Sturgeon, white, juvenile, effect of ration and body size on the energy budget of, 863
Sunde, L. M. (see Imsland, A. K.), 926
Sutela, T. (see Huusko, A.), 441
Svåsand, T., Jørstad, K. E., Otterå, H. and Kjesbu, O. S., Differences in growth performance between Arcto-Norwegian and Norwegian coastal cod reared under identical conditions, 108
Swimming speeds, measurements of aerobic metabolism of a school of horse mackerel at different, 854
Synbranchus marmoratus, presence of primary and secondary males in a population of, 788

Tahara, D. and Mugiya, Y., Diel variation in branchial calcium uptake by the rainbow trout, 1034
Tambaqui, muscle development in, 842
Taverne, N. (see Rombout, J. H. W. M.), 521
Taverne-Thiele, J. J. (see Rombout, J. H. W. M.), 521
Taylor, W. W. (see Ferreri, C. P.), 763
Teleostei: Tetraodontidae, how they swim, 319
Temperature, contractile properties and the inheritance of myosin heavy chains in *Oreochromis* species with different temperature tolerances, 541
Temperature, effect on the embryonic lesser spotted dogfish, 965
Temperature, effect on the growth of the embryonic dogfish, *Scyliorhinus canicula*, 739
Temperature, effect on the optimal substrate for β-oxidation, 753
Temperature, effects on gastric excretion in small cod and whiting, 702
Temperature, effects on growth and metabolism in juvenile turbot, 678
Temperature, exposure of goldsinny, rock cook and corkwing wrasse to low temperature and low salinity, 41
Temperature, hypometabolism in torpid goldsinny wrasse subjected to rapid reductions in seawater temperature, 64

Temperature, interaction with fish size on growth of juvenile turbot, 926
Temperature- and light-mediated predation by perch on vendace larvae, 441
Territorial and non-territorial spawning behaviour in the bream, 622
Thermal acclimation, short term, induces adaptive changes in the inner mitochondrial membranes of fish skeletal muscle, 1280
Thomason, J. C., Conn, W., Le Comte, E. and Davenport, J., Effect of temperature and photoperiod on the growth of the embryonic dogfish, *Scyliorhinus canicula*, 739
Thomason, J. C., Davenport, J. and Le Comte, E., Ventilatory mechanisms and the effect of hypoxia and temperature on the embyronic lesser spotted dogfish, 965
Thorarensen, H., Gallaugher, P. E. and Farrell, A. P., The limitations of heart rate as a predictor of metabolic rate in fish, 226
Thorpe, J. E. (see Mikheev, V. N.), 494
Thrombocytes, characterization of carp thrombocytes with specific monoclonal antibodies, 521
Tierney, J. F., Huntingford, F. A. and Crompton, D. W. T., Body condition and reproductive status in sticklebacks exposed to a single wave of *Schistocephalus solidus* infection, 483
Tilapia spp., glycohistochemistry of the stomach, 584
Tilapia strains, statistical power analysis of the 'internal reference' technique for comparing growth and growth depensation of, 277
Toften, H. and Jobling, M., Development of spinal deformities in Atlantic salmon and Arctic charr fed diets supplemented with oxytetracycline, 668
Tomasini, J. A., Collart, D. and Quignard, J. P., Female reproductive biology of the sand smelt in brackish lagoons of southern France, 594
Torricelli, P. (see Lugli, M.), 648
Torricelli, P. (see Serventi, M.), 1163
Trawling, effects of five years of intensive trawling on a previously unexploited smelt stock, 329
Triplefins, estuarine, *Forsterygion nigripenne*, ultrastructure of the glandular epidermis of the fins of male, 95
Trout, brown, direct estimates of the selectivity of a multimesh and series of single gillnets for, 33
Trout, brown, food- and habitat-segregation in sympatric grayling and, 301
Trout, brown, species-specific nuclear DNA marker for identification of hybrids between Atlantic salmon and brown trout, 537
Trout, lake, compensation in individual growth rates and its influence on population dynamics in the Michigan waters of Lake Superior, 763
Trout, rainbow, aggressive behaviour of underyearlings in simulated winter concealment habitat, 237
Trout, rainbow, competitive advantage of large body size declines with increasing group size, 370
Trout, rainbow, diel variation in branchial calcium uptake by, 1034
Trout, rainbow, gastrointestinal responses to dry pellet and low-fat herring diets, 501
Trout, rainbow, interindividual variations in feeding and growth during restricted feeding and in a subsequent period of compensatory growth, 658
Trout, rainbow, juvenile, effect of AC electroshock on blood features in, 1330
Trout, wild sea-run brown, date of smolt migration dependes on body-size but not age in, 157
Turbot, Antioxidant enzyme activities in embryologic and early larval stages, 986
Turbot, juvenile, effects of temperature on growth and metabolism in, 678
Turbot, juvenile, interaction of temperature and fish size on growth of, 926
Turbot larvae, dietary ascorbic acid requirements during the hatchery production of, 573
Turunen, T. (see Horppila, J.), 329
Tytler, P. (see Wales, W.), 801

Uglow, R. F. (see Buttle, L. G.), 693

Ultrastructure of the glandular epidermis of the fins of male estuarine triplefins *Forsterygion nigripenne*, 95
Un-ionized ammonia, morphological changes in the gills of *Lophiosilurus alexandri* exposed to, 778
Urea levels and plasma ammonia in Atlantic salmon farmed in sea water, 165
Use of pigmentation and morphological characters to identify Italian mullet fry, 1163

Validation of back-calculation formulae for cod otoliths, 973
Vendace larvae, temperature- and light-mediated predation by perch on, 441
Ventilatory mechanisms and the effect of hypoxia and temperature on the embryonic lesser spotted dogfish, 965
Vertebra width, relationship with body length of Atlantic salmon differs between parr and smolts, 1038
Vertebral number in Ponto-Caspian gobies: phylogenetic relevance, 1027
Vieira, V. L. A. and Johnston, I. A., Muscle development in the tambaqui, an important Amazonian food fish, 842
Viral diseases, prophylactic treatment of using native RNA linked to soluble and corpuscular carriers, 195
Vitturi, R., Libertini, A., Mazzola, A., Colomba, M. S. and Sara, G., Characterization of mitotic chromosomes of four species of the genus *Diplodus*: karyotypes and chromosomal nucleolar organizer region phenotypes, 1128
Vuorimies, O. (see Huusko, A.), 441

Wales, W. and Tytler, P., Changes in chloride cell distribution during early larval stages of *Clupea harengus*, 801
Walleye larvae, gut evacuation and absorption efficiency of, 375
Wardle, C. S., Soofiani, N. M., O'Neill, F. G., Glass, C. W. and Johnstone, A. D. F., Measurements of aerobic metabolism of a school of horse mackerel at different swimming speeds, 854
Waring, C. P. (see Alkindi, A. Y. A.), 1291
Weight/length relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia, 731
Wells, R. M. G. (see Lowe, T. E.), 287
Wetherbee, B. M., Distribution and reproduction of the southern lantern shark from New Zealand, 1186
White sea bream, genetic differentiation within the Lion's Gulf and the Ligurian Sea (Mediterranean Sea), 613
White sturgeon, juvenile, effect of ration and body size on the energy budget of, 863
Whiting, effects of temperature, prey type and prey size on gastric excretion in, 702
Wijegoonawardena, N. D. N. S. (see De Silva, S. S.), 1153
Winemiller, K. O. and Kelso-Winemiller, L. C., Comparative ecology of catfishes of the upper Zambezi River floodplain, 1043
Winter concealment habitat, aggressive behaviour of underyearling rainbow trout in, 237
Withler, R. E. (see Beacham, T. D.), 411
Wootton, R. J. (see Russell, N. R.), 206
Wrasse, goldsinny, hypometabolism when subjected to rapid reductions in seawater temperature, 64

Yamamoto, T. S. and Kobayashi, W., Formation of the enveloping layer of the chum salmon egg in isotonic salt solutions, 895

Zambezi River, comparative ecology of catfishes of the upper Zambezi River floodplain, 1043
Zhu, X. (see Cui, Y.), 863